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APPETITE AS A GUIDE IN FEEDING DAIRY CALVES

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APPETITE AS A GUIDE IN FEEDING DAIRY CALVES

By A. C. McCandlish

Appetite, as an indicator of physiological needs, has been minimized by many investigators in the field of human and animal nutrition. From the beginning the whole animal kingdom has been controlled in its feeding problems only by appetite and environmental limitations of the food supply. Consequently, even tho the role of appetite be not of great importance under artificial experimental conditions, yet, if the broad facts of the case, the continued existence and multiplication of man and other animals, after countless aeons of feeding with appetite as their sole guide, be taken into consideration, it must be recognized as of some value.

PREVIOUS WORK.

The attention that has been given to the study of appetite can hardly be called critical. Evvard (1) has reviewed the literature on the subject and shown that appetite is a fairly reliable indicator of the physiological needs of the pig. A very limited amount of work has been done with cattle, but other material, not obtained with a view to studying the appetite of animals, may be reviewed here as of interest in connection with the work reported on the grinding of grain for calves.

It has been stated by Jordan (3) that the grinding of oats and corn increased their digestibility in the case of horses, tho with sheep whole oats were as completely utilized as ground grain.

Fain and Jarnagin (2) found that, where corn meal and shelled corn were used to supplement skim milk for calves, the daily consumption of shelled corn was greater than that of corn meal, tho the rate of gain was greater and the amount of grain consumed per 100 lbs. live weight gain less in the case of the shelled corn. Kildee (4) also recommended whole oats in preference to ground oats for calves. Otis (5) found that calves fed shelled corn made larger gains and consumed less skim milk and hay, but slightly more grain per 100 pounds live weight gain, than did those fed corn chop. He also found that skim milk calves, two to three months old, consumed about 10 lbs. of water per head daily.

OBJECTS OF INVESTIGATION.

This work was outlined with a view to obtaining information on the following points in the feeding of young dairy calves:

1. The efficiency of the free choice system in the growing of calves.

2. The ability of calves to select the feeds best adapted to their requirements.
3. The relative palatability of ground and unground grain to calves.
4. The relative palatability of some common protein supplements to calves.
5. The water requirements of young dairy calves.
6. The salt and charcoal requirements of calves.

EXPERIMENTAL WORK

Three calves, two heifers and a bull were used. All were in good growthy condition and information concerning them is given in table I.

TABLE I.—ANIMALS USED.

Calf No.	411	413	414
	Guernsey	Ayrshire	Holstein
Sex	M	F	F
Initial age, days	70	37	30
Initial weight, lbs.	146	110	110

From the time they were taken from their dams at about 3 days of age, until the beginning of the experiment, the calves had been fed whole milk. All had become accustomed to consuming small quantities of hay, while the bull, No. 411, was the only one familiar with grain.

The experiment lasted for two periods of 30 days each, and thruout this time the animals were given what milk was thot to be suited to their needs, skim milk being used to replace part of the whole milk as they became older. A supply of alfalfa hay, of medium quality, was kept before the animals at all times. A self-feeder in the pen contained the following feeds in separate compartments:

Shelled corn	Linseed oil meal (old process)
Cracked corn	Wheat bran
Whole oats	Corn gluten feed
Ground oats	Salt
Hominy feed	Charcoal

For a few hours each day fresh water was kept in front of the calves.

At the beginning of the experiment and at the end of each 30-day period the animals were weighed on each of three consecutive days. The average of the three consecutive weighings was taken as the live weight of the animals.

A daily record was kept of the amounts of milk, hay and water consumed and records of the other feeds used were obtained for each 30-day period.

Moisture determination were made on all feeds to allow of the computation of the total water and dry matter consumption.

DISCUSSION OF RESULTS.

Milk consumption records were obtained for each animal and in table II are given by 30-day periods.

TABLE II.—INDIVIDUAL MILK CONSUMPTION (ARBITRARILY ALLOWED.)

Period No.	I.			II.		
Calf No.	411	413	414	411	413	414
Whole milk, lbs.	276	294	294	226	226	226
Skim milk, lbs.	84	42	42	226	226	226
Total milk, lbs.	360	336	336	452	452	452

In period I the bull was given more milk than the heifers, but during period II each animal received 226 lbs. of whole milk with an equal quantity of skim milk.

The total consumption for the group, of whole and skim milk, the various concentrates, hay, salt, charcoal and water are collected in table III.

TABLE III.—TOTAL FEED CONSUMPTION.

Period	I.	II.
MILK—	Lbs.	Lbs.
Whole	864	678
Skim	168	678
CONCENTRATES—		
Shelled corn	1.3	108.6
Cracked corn	.0	.3
Whole oats	58.7	68.4
Ground oats	.4	.5
Hominy feed	.0	.3
Gluten feed	15.3	1.9
Wheat bran	13.3	17.3
Oil meal (O. P.)	62.7	75.6
Alfalfa hay	32.7	91.9
Salt	1.1	.3
Charcoal	.7	1.3
Water	384	689

The relative consumption of whole and ground grains can be more clearly appreciated when they are considered separately.

TABLE IV.—CONSUMPTION OF WHOLE AND GROUND GRAINS

Period	I.	II.	Total
WHOLE GRAIN—	Lbs.	Lbs.	Lbs.
Corn	1.3	108.6	
Oats	58.7	68.4	237.0
GROUND GRAIN—			
Corn	.0	.3	
Oats	.4	.5	
Hominy	.3	.0	1.5

From this evidence one fact is very apparent—the calves showed a decided preference for the whole rather than the ground grains. During period I practically no corn was consumed but in period II there were 108.6 lbs. of whole corn and only .3 lbs.

of cracked corn taken. The whole oats was consumed to the extent of 58.7 lbs. in the first period and 68.4 lbs. in the second period while never more than .5 lbs. of ground oats were consumed in 30 days. Hominy feed was also neglected in favor of the whole corn and oats. The total consumption of whole grain was 237 lbs. while that of ground grain was 1.5 lbs.

Oil meal was the most favored of the nitrogenous concentrates, and the consumption of it increased as the experiment progressed. Wheat bran was a poor second while gluten feed appeared to be the least desirable, as only 1.9 lbs. of it were consumed during period II as compared with a consumption of 15.3 lbs. in period I. This decided decrease in consumption of gluten feed may perhaps be linked up with the increase in consumption of shelled corn, which in turn was probably due to another factor, the skim milk increase in the ration.

As the experiment progressed the daily allowance of skim milk was increased at the expense of the whole milk. This tended to narrow the nutritive ratio of the ration. The calves counteracted this, however, by increasing their consumption of low protein concentrates from 60.4 lbs. in period I to 178.1 lbs. in period II, or 195%, while the increase in their consumption of high protein concentrates was relatively smaller, varying from 91.3 lbs. in period I to 94.8 lbs. in period II, or only 4%.

The consumption of alfalfa hay, water and charcoal increased as the experiment progressed, while that of salt decreased.

TABLE V.—AVERAGE DAILY FEED PER CALF.

Period	I.	II.
	Lbs.	Lbs.
Whole milk	9.60	7.53
Skim milk	1.87	7.53
Concentrates	1.69	3.03
Hay	.36	1.02
Salt	.012	.003
Charcoal	.008	.013
Water	4.27	7.66

From this it is apparent that the consumption of grain, hay and water increased very rapidly with the growth of the calves, the average daily requirements of water mounting from 4.27 lbs. in period I to 7.66 lbs. in period II.

TABLE VI.—CONSUMPTION OF DRY MATTER AND WATER.

Constituent	Dry Matter		Water	
Period	I.	II.	I.	II.
	Lbs.	Lbs.	Lbs.	Lbs.
Milk	127.8	153.3	904.2	1,202.7
Concentrates	133.6	230.4	18.1	42.5
Hay	27.7	77.9	5.0	14.0
Condiments	1.8	1.6		
Water			384.	689.
Total	290.9	463.2	1,311.3	1,948.2

This again demonstrates the rapid increase in dry matter consumption from 290.9 lbs. in period I to 463.2 lbs. in period II, while the total consumption of water, as drinking water and in the feed, increased from 1311.3 lbs. to 1948.2 lbs., or from 14.57 lbs. per day in period I to 21.65 lbs. per day in period II.

TABLE VII.—LIVE WEIGHT GAINS.

Calf No.	411	413	414	Total	Average
LIVE WEIGHTS—	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
Initial	146	110	110	366	122
Middle	209	158	164	530	177
Final	278	219	226	723	241
LIVE WEIGHT GAINS—					
Period I	63	48	54	165	55
Period II	69	61	62	192	64
Total	132	109	116	357	119
AVERAGE DAILY GAINS—					
Period I	2.10	1.60	1.80	5.50	1.83
Period II	2.30	2.03	2.07	6.40	2.13
Average	2.20	1.82	1.93	5.95	1.98

The live weight gains were very creditable, being from 1.60 lbs. to 2.30 lbs. and averaging 1.98 lbs. per head per day. The calves did not become too fat but remained in good growthy condition—that most desirable for young dairy calves.

TABLE VIII.—FEED REQUIRED FOR 100 LBS. LIVE WEIGHT GAIN.

Period	I.	II.
	Lbs.	Lbs.
Whole milk	524	353
Skim milk	102	353
Grain	92	142
Hay	20	48
Water, drinking	233	359
Total dry matter	176	241
Total water	795	1,015

The feed requirements for 100 lbs. live weight gain are relatively low.

The calves showed distinct preference for some of the grain preparations, but there is the question, how near did they come to balancing their rations in accordance with the concepts of modern feeding standards?

TABLE IX.—ACTUAL AND EXPECTED CONSUMPTION OF NUTRIENTS BY CALVES.

Period	I.		II.	
Nutrients	Actual	Expected	Actual	Expected
Total dry matter, lbs.	209.9	267.9	463.2	412.8
Digestible crude protein, lbs.	66.4	43.8	94.1	60.9
Total digestible nutrients, lbs.	292.8	230.1	425.1	327.9
Nutritive ratio	1:3.4	1:4.3	1:3.5	1:4.4

The consumption of dry matter and digestible nutrients by the calves is seen to be well above expectations but it has already been shown that the heavy feed consumption led to large and economical gains. According to the Modified Wolff-Lehmann Feeding

Standard the feed for the calves should on the average have had a nutritive ratio of 1:4.3 in the first period and 1:4.4 in the second. However, the calves seemed to prefer a ration with a much narrower nutritive ratio. For the first and second periods the nutritive ratios of the rations were 1:3.4 and 1:3.5 respectively. In this choice of a narrower nutritive ratio the calves were possibly correct. The calves grew rapidly and gained in weight but did not become too fat and this is the desirable method of growing out young dairy animals.

SUMMARY

This work is too limited in scope to allow of the making of definite recommendations but a few points of interest stand out clearly:

1. Young calves prefer whole corn and oats to the ground grains.
2. Hominy feed does not appear to be palatable to calves.
3. Oil meal (O. P.) appears to be more palatable than wheat bran, while corn gluten feed is not in favor with calves.
4. Calves have the ability to vary their consumption of concentrates to comply with their needs. For example, when whole milk is replaced by skim milk the calves increase their relative consumption of low protein concentrate feeds such as corn and oats.
5. The calves used in this work consumed a ration of much narrower nutritive ratio than is generally recommended.
6. The calves maintained the nutritive ratio of their ration fairly constant tho it became wider as the calves advanced in age.
7. The consumption of hay increased materially as the calves became older.
8. Salt and charcoal were evidently desired by the calves.
9. Water is important, even for calves fed milk.
10. This trial with the free choice system, tho not demonstrating the advisability of its use in the rearing of dairy calves, shows that there lie therein possibilities which are well worthy of further study.

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